Key

Practice Problems – Energy

Energy formulas: KE = $\frac{1}{2}mv^2$ GPE = mgh ME = $KE + PE$

at is the kinetic energy of a baseball moving at a speed of 40 m/s if the baseball has a mass of 0.15 kg?

GIVEN:
$m = .15kg$
$v = 40m/s$
$KE = ?$

FORMULA:
$KE = \frac{1}{2}mv^2$

WORK:
$KE = \frac{1}{2}(.15)(40^2)$

ANSWER: 120 J

ar moving at a speed of 20 m/s has a kinetic energy of 300,000 J. What is the car's mass?

GIVEN:
$v = 20m/s$
$KE = 300,000J$
$m = ?$

FORMULA:
$KE = \frac{1}{2}mv^2$

WORK:
$300,000 = \frac{1}{2}(m)(20^2)$
$600,000 = m(400)$
$\frac{600,000}{400} = m$

ANSWER: 1500 kg

printer has a mass of 80 kg & a kinetic energy of 4,000 J. What is the sprinter's speed?

GIVEN:
$v = ?$
$m = 80kg$
$KE = 4000J$

FORMULA:
$KE = \frac{1}{2}mv^2$

WORK:
$4000 = \frac{1}{2}(80)v^2$
$8000 = 80(v^2)$
$\sqrt{100} = \sqrt{v^2}$
$10 = v$

ANSWER: 10 m/s

l the height of a baseball with a mass of 0.15 kg that has a GPE of 73.5 J.

GIVEN:
$GPE = 73.5J$
$m = .15$
$g = 10m/s^2$
$h = ?$

FORMULA:
$GPE = mgh$

WORK:
$73.5 = (.15)(10)(h)$
$\frac{73.5}{1.5} = \frac{1.5(h)}{1.5}$

ANSWER: 49 m

Name _____ Period _____

5 – Find the GPE of a coffee mug with a mass of 0.3 kg on a counter 1 m high.

GIVEN:
GPE = ?
m = .3kg
g = 10 m/s²
h = 1m

FORMULA:
GPE = mgh

WORK:
GPE = (.3)(10)(1)

ANSWER: 3 J

6 – What is the mass of a hiker 200 m above the ground if her GPE is 117,600 J?

GIVEN:
GPE = 117,600 J
m = ?
g = 10 m/s²
h = 200 m

FORMULA:
GPE = mgh

WORK:
117,600 = m(10)(200)

$\frac{117,600}{2000} = \frac{m(2000)}{2000}$

ANSWER: 58.8 kg

7 – What is the kinetic energy of a ball with a mass of 0.06 kg moving at 50 m/s?

GIVEN:
KE = ?
m = .06 kg
v = 50 m/s

FORMULA:
$KE = \frac{1}{2}mv^2$

WORK:
$KE = \frac{1}{2}(.06)(50^2)$

ANSWER: 75 J

8 – An 80 kg driver jumps form a 10 m high platform. What is the GPE energy of the diver halfway down?

GIVEN:
GPE = ?
m = 80kg
g = 10m/s²
h = 5m ← halfway

FORMULA:
GPE = mgh

WORK:
GPE = (80)(10)(5)

ANSWER: 4000 J

9 – Explain whether an object can have kinetic energy & potential energy at the same time.

ANS may vary ex ball half way down a hill.

10 – Explain how the kinetic energy of a truck can be increased without increasing the truck's speed.

Increase the mass off the truck.

Period _____

ıme _____

– What is the kinetic energy of a 5 kg object moving at 7 m/s?

GIVEN:
$KE = ?$
$m = 5kg$
$v = 7m/s$
FORMULA:
$KE = \frac{1}{2}mv^2$

WORK:
$KE = \frac{1}{2}(5)(7^2)$

ANSWER: 122.5 J

- An object has a kinetic energy of 600 J & a velocity of 10 m/s. What is the object's mass?

GIVEN:
$KE = 600J$
$m = ?$
$v = 10m/s$
FORMULA:
$KE = \frac{1}{2}mv^2$

WORK:
$600 = \frac{1}{2}(m)(10^2)$
$\frac{1200}{100} = \frac{m(100)}{100}$

ANSWER: 12 kg

· A 0.4 kg ball has a kinetic energy of 80 J. What is the ball's velocity?

GIVEN:
$KE = 80J$
$m = .4kg$
$v = ?$
FORMULA:
$KE = \frac{1}{2}mv^2$

WORK:
$80 = \frac{1}{2}(.4)(v^2)$
$160 = (.4)(v^2)$
$\sqrt{400} = \sqrt{v^2}$

ANSWER: 20 m/s

A car has a mass of 900 kg & is traveling at 25 m/s. What is the car's kinetic energy?

GIVEN:
$KE = ?$
$m = 900kg$
$v = 25m/s$
FORMULA:
$KE = \frac{1}{2}mv^2$

WORK:
$KE = \frac{1}{2}(900)(25^2)$

ANSWER: 281,250 J

An object has a mass of 80 kg & is on a platform 3 m above the ground. What is its GPE?

GIVEN:
$GPE = ?$
$m = 80kg$
$g = 10m/s^2$
$h = 3m$
FORMULA:
$GPE = mgh$

WORK:
$GPE = (80)(10)(3)$

ANSWER: 2400 J

Period _____

erson has a GPE of 10,000 J & a weight of 500 N. How high above the floor are they?

GIVEN:
GPE = 10,000 J
m = 500 N
g =
h = ?

FORMULA:
GPE = mgh

WORK:
$\frac{10000}{500} = \frac{500\,h}{500}$

ANSWER: 20 m

it is the GPE of a diver with a mass of 60 kg who is on a board 10 m high?

GIVEN:
GPE = ?
m = 60 kg
g = 10 m/s²
h = 10 m

FORMULA:
GPE = mgh

WORK:
GPE = (60)(10)(10)

ANSWER: 6000 J

kg book is moved from a shelf that is 2 m high to a shelf that is 1.5 m high. What is its change in GPE?

GIVEN:
GPE = ?
m = 2 kg
g = 10 m/s²
h = 2 m & 1.5 m

FORMULA:
GPE = mgh

WORK:
GPE = 2(10)(2)
GPE = 40 J
GPE = 2(10)(1.5)
GPE = 30 J
40 J − 30 J =

ANSWER: 10 J

ollercoaster moving around a turn has a kinetic energy of 23,000 J & a gravitational potential energy of J. What is its mechanical energy?

GIVEN:
ME = ?
KE = 23,000 J
PE = 100,000 J

FORMULA:
ME = KE + PE

WORK:
ME = 23,000 + 100,000

ANSWER: 123,000 J

Name _____ Period _____

0 - A system has a total mechanical energy or 350 J & kinetic energy of 220 J. What is its potential energy?

GIVEN:
ME: 350 J
KE: 220 J
PE: ?

FORMULA:
ME = KE + PE

WORK:
350 = 220 + PE

ANSWER: 130 J

– At the top of a hill, a rollercoaster has 67,500 J of kinetic energy & 290,000 J of gravitational potential energy. Gradually the rollercoaster comes to a stop due to friction. If the coaster has 30,000 J of potential energy when it stops, how much energy is converted to heat energy through friction?

GIVEN:
Top: KE: 67,500 J
PE: 290,000 J
Bottom: PE: 30,000 J
KE: 0 J

FORMULA:
ME = KE + PE

WORK: Top
ME: 67,500 J + 290,000 J
ME: 357,500 J
Total

Bottom:
ME = KE + PE + Friction
357,500 = 0 + 30,000 J + Friction

ANSWER: 327,500 J